E-commerce and prices - theory and evidence

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Abstract:
This paper examines the relation between prices in conventional stores and on the Internet. The main results from the theoretical analysis are that i) we expect a discrete fall in prices in conventional stores as the share of the population with Internet-access reaches a critical level, ii) the relation between prices depends on convenience costs of shopping in regular stores as well as on transport and navigation costs for goods bought over Internet, and iii) retailers who only sell through Internet have lower on-line prices than retailers who also sell through conventional stores. The empirical section employs a rich data set covering the Swedish markets for books and CDs. Prices of these goods are on average 15 percent lower on Internet, but if a single item is bought, transport costs will make it as expensive to buy over Internet as in a regular store (if a basket of goods is bought it is some 10 percent cheaper on Internet since transport costs are fixed). There is firm support for that retailers who only sell over Internet have lower on-line prices.

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1 Introduction

At the time of writing the Internet is of very limited importance as a retail channel, almost regardless of what market that is analyzed. However, the future potential may be great - many commentators see the selling of goods and services over the Internet, e-commerce, as enabling a frictionless economy and implying the "death of distance". This in turn impacts issues such as the strength of competition on markets, the constraints facing fiscal and monetary policy on a national level and economic geography (where transport costs and distance play a central role; see for instance Fujita, Krugman and Venables, 1999). Consequently, the rapid growth of e-commerce has sparked tremendous attention amongst policy makers and media and led to a large number of management books.[1] In contrast, there has been little formal modeling or comprehensive empirical analysis of e-commerce. In partial remedy, this paper constructs a simple model to analyze the relation between prices in local markets and prices on the Internet. The predictions of the model are tested using data on the Swedish markets for books and music CD's.

E-commerce is developing quickly. We expect improvements in the ease of navigating shopping sites, download speed, payment security and lower costs of transporting goods to the consumer, for instance through downloadable music and "print on demand" books. We also expect the share of the population with Internet-access to increase. It is therefore important to consider not only current empirical evidence but also to try understanding the mechanisms at play. The model in this paper derives demand from consumers' maximization problems - a key feature is the trade-off between convenience costs of shopping in the regular stores vis-à-vis transport and navigation costs on the Internet (in the remainder of the paper we will refer to regular stores as B&M, brick and mortar, stores). Prices online and in B&M stores will depend on the relationship between these costs, and on the proportion of consumers with access to the Internet. One important conclusion is that if this proportion is sufficiently small, the B&M retailers will not lower prices in response to competition from Internet retailers. However, as Internet access reaches a critical level, prices fall discretely and the competitive effect of on-line retailers thus occurs suddenly. The model also shows how equilib-

[1] See for instance OECD (1999), U.S. Government Working group on Electronic Commerce (1999), Shapiro and Varian (1999) or Schwartz (1999).

rium prices may be both higher or lower on the Internet than in B&M stores, depending on the perceived costs of shopping in B&M stores and on navigation and transport costs. A consequence of this is that prices may initially be lower on-line than in B&M stores, while the relation is reversed in the long run. We also compare the optimal pricing strategies of retailers selling only through Internet (In the remainder of the paper, we denote these pure Internet retailers.) with those that sell both through B&M stores and over Internet (In the remainder of the paper, we denote these mixed retailers). The model predicts that the latter type of firms charge strictly higher on-line prices than the former. The reason for this is that mixed firms will consider the loss of sales in their B&M business when setting the on-line price.

To date there exists little theoretical analysis of competition that pays attention to the institutional characteristics of the Internet. The perhaps closest in modeling terms is Anderson and Ginsburgh (1999) who examine deviations from the law of one price when there is both second and third degree price discrimination. Even though our model could be used to discuss such issues we choose to focus on the above questions. It should also be noted that our focus is on the interaction between local and on-line markets. The interaction between e-retailers, which is an important field of study, is outside the scope of this paper.

The limited empirical evidence on e-commerce that exists so far has largely focused on the issue of whether it is cheaper to buy on the Internet. Smith, Bailey and Brynjolfsson (1999) provide an excellent survey. As regards price levels, Lee (1997) finds that prices for used cars are higher on the net and Bailey (1998) find the same for books, CDs and software. Brynjolfsson and Smith (1999) examine the prices of books and CD's in regular and Internet stores concluding that prices are lower on the Internet. A number of issues leads one to question the generalizability of these results however. Lee does not control for quality differences and Brynjolfsson and Smith only include data from four B&M stores dispersed across the US. As we shall see in our empirical analysis there is very substantial price dispersion across B&M stores, making it important to have a representative sample of stores to be able to make statements that generalize beyond the specific sample.

Sweden offers a good laboratory for examining e-commerce since it has been in the forefront of Internet development. At the time of the study, fall 1999, Internet penetration in Sweden is deeper than almost anywhere else in the world. Around 60 percent of the total population regularly uses the Internet and in the age-group 15-29 years the figure is 91 percent.[2] E-commerce accounts for 1.2 percent of total retail sales - about the same share as in the US, and much larger than in most other European countries.[3] The homogeneity of sales taxes and costs across locations in Sweden facilitates analysis compared to the US - where differences in local sales taxes appears to be an important factor driving Internet buying (Goolsbee, 2000).

Our data-set includes price information on a number of well specified goods from all Swedish e-commerce sites and a very large sample of B&M stores, operating in 19 local markets, including background information on these stores. In our sample, prices on the Internet are lower than in B&M stores. If one buys a basket of books or CDs this conclusion holds also after transport costs are included in the on-line price. If only a single item is bought the price of a book on the Internet is only slightly lower than in a B&M store and for a CD the transport cost eradicates any savings on price from buying over the Internet. Further, the hypothesis that mixed firms have higher prices on-line than pure Internet retailers is firmly supported by the data.

The next section presents the model and Section 3 examines the predictions of the model. Section 4 analyses the empirical evidence and the last section concludes.

2 The Model

There are n identical, local markets for good j denoted with subscripts $A, B, C, \ldots.$ Without loss of generality we will focus attention on market A. In each market there is a continuum of consumers whose valuation of the good is given by θ which is uniformly distributed on $[0, 1]$. Assume further that a uniformly distributed fraction v of consumers has access to Internet. A consumer in market A with access to the Internet has utility

$$u = \begin{cases} \theta - t\theta - p_A & \text{B\&M shopping} \\ \theta - T - p_I & \text{online shopping} \\ 0 & \text{no consumption.} \end{cases} \tag{1}$$

[2]"Sex av tio svenskar använder internet." ("Six out of ten Swedes use the Internet." Newspaper article based on a poll by Demoscop, a survey company.)

[3]"Internetindikatorn 4:e kvartalet 1999" (Internet indicator, 4th quarter 1999.)

where p_A is the price in the B&M store and $t\theta$ the opportunity cost of shopping[4], p_I is the price on-line and T the fixed cost of buying the goods on-line (this includes access costs a as well as pure transportation costs τ). For consumers without access to Internet utility is given by

$$u = \begin{cases} \theta - t\theta - p_A & \text{B\&M shopping} \\ 0 & \text{no consumption} \end{cases} \tag{2}$$

The supply-side is very simplified. The sum of the local markets is the total market. Local markets are indexed with subscripts. In market A there is a single B&M retail store setting a price p_A with marginal cost c_A. A B&M firm can sell in the local market only. On-line stores can sell in all local markets but have to charge the same price, p_I, in all markets. They produce at marginal cost c_I.

We first analyze the effect of Internet competition on B&M prices under the assumption that there is free entry of on-line retail stores. In equilibrium the price on-line has to equal average cost $p_I = AC_I$. In the following section we treat the on-line price as parametric for simplicity. We are interested in an equilibrium in which both types of firms can be active. The average cost of on-line firms is, therefore, assumed to be sufficiently low to allow for entry in the segmented equilibrium, that is $AC_I + T < p_A^* + t$.

3 Prices on the Internet and in local markets

3.1 Does Internet lead to lower B&M prices?

The first issue that we want to examine is if e-commerce does indeed exert a competitive pressure on prices in local markets. Our aim is to illustrate the conditions for a pro-competitive effect as well as the magnitude of the effect. To do this we first derive the B&M prices in the absence of Internet and under perfect segmentation before proceeding to a comparison of B&M prices when there are Internet retailers.

[4] A positive t means that consumers who have high valuation of the good are assumed to also have higher opportunity costs of going to the store to shop. Conversely a negative t would mean that people with high valuation of the good would also "love to shop".

3.1.1 Perfect segmentation and no Internet

Consider a perfectly segmented equilibrium without on-line stores. We can think of this benchmark as a situation in which consumers have high search costs or prohibitive transportation costs across markets, but perfect information and no transactions costs (except the opportunity cost of shopping) within the local market. A consumer with valuation θ would buy from the local store if

$$\theta - t\theta - p_A \geq 0 \tag{3}$$

which implies a cut-off value, $\theta_A(p_A)$ or θ_A for short, where

$$\theta_A = \frac{p_A}{1-t} \tag{4}$$

and the local monopolist solves

$$\max_{p_A} (1-\theta_A)(p_A - c_A) \tag{5}$$

which has a first order condition

$$\left[(1-\theta_A) - \frac{d\theta_A}{dp_A}(p_A - c_A)\right] = 0 \tag{6}$$

which gives an optimum at

$$p_A^* = \frac{1 + c_A - t}{2} \tag{7}$$

where the superscript denotes the equilibrium and p_A^* is henceforth referred to as the local monopoly price.

3.1.2 Internet competition

Next, consider the impact of Internet competition. In the population with access to Internet a consumer with valuation θ would buy from an on-line store if

$$\theta - T - p_I \geq \theta - t\theta - p_A \geq 0 \tag{8}$$

which gives an indifferent consumer with valuation $\widetilde{\theta}(p_I, p_A)$ or $\widetilde{\theta}$ for short, where

$$\widetilde{\theta} = \min\left\{\frac{1}{t}(p_I + T - p_A), 1\right\} \tag{9}$$

and the demand at the B&M store in this population is

$$D_A(p_A, p_I) = \begin{cases} \widetilde{\theta} - \theta_A & \text{if } p_A \leqslant (p_I + T)(1-t) \\ 0 & \text{if } p_A > (p_I + T)(1-t) \end{cases} \tag{10}$$

3.1.3 Yes, and it says bang!

The B&M firm solves

$$\max_{p_A} \left((1-v)(1-\theta_A) + v\left(\widetilde{\theta} - \theta_A\right)\right)(p_A - c_A) \tag{11}$$

which has one or two local optima; an interior and a corner solution.

First, consider the interior local optimum. In the interior solution the B&M firm sets a price which yields revenues from both populations (consumers with access as well as without access to on-line stores). The interior first order condition is:

$$\left[(1-\theta_A) - \frac{d\theta_A}{dp_A}(p_A - c_A)\right] - v\left[\left(1-\widetilde{\theta}\right) - \frac{d\widetilde{\theta}}{dp_A}(p_A - c_A)\right] = 0 \tag{12}$$

which is partly identical to the first order condition in the segmented equilibrium, eq. (6). The first term on the left hand side is the monopolist's incentive to maximize profits while the second term in is the pro-competitive effect of on-line competition. The pro-competitive effect shows that the direct effect on profits of a price increase is less than in the segmented equilibrium since it also results in a flow of consumers to the on-line retailers. The pro-competitive effect is increasing in the share of consumers with on-line access (v).

The interior local optimum, however, is not always the global optimum. For very low prices on-line, such that $\widetilde{\theta} - \theta_A < 0$ at p_A^*, and a small fraction with on-line access, the B&M store prefers to sell at a high price to the population without access rather than trying to steal some customers from the on-line stores. More precisely, for sufficiently low v (close to zero) the corner solution is the global optimum and the equilibrium price is p_A^*. However, as the fraction with access increases, the weight of the revenues from the on-line-population increases in the B&M firms profit function. At some critical fraction $\overline{v}$ the equilibrium shifts to the interior solution and the price falls discretely from p_A^* to p_A^v. The critical value is (implicitly) given by

$$\left((1-\theta_A^v) - \overline{v}\left(1-\widetilde{\theta}^v\right)\right)(p_A^v - c_A) = (1-\overline{v})(1-\theta_A^*)(p_A^* - c_A) \tag{13}$$

where the superscripts refer to the value in the local optimum. The following proposition states the result:

Proposition 1 *If only a small fraction of the population has access to on-line stores, $v \leqslant \overline{v}$, the equilibrium price in the local market is equal to the local monopoly price p_A^*, but if the fraction is sufficiently large, $v > \overline{v}$, the equilibrium price falls to p_A^v, where p_A^v is falling in v and $p_A^v < p_A^*$ for all $v \in (0,1]$.*

Proof. (Sketch) For $v = \varepsilon$ and low $p_I + T$ the monopoly profit in population $(1 - v)$ is larger than the duopoly profit in the whole population. For $v = 1$ the opposite is true. From the theorem of intermediate values there exist a $\overline{v}$, such that (13) holds with equality. The solution is unique and equals

$$\overline{v} = \left(1 + \frac{\left[c_A - (1-t)\left(p_I + T\right)\right]^2}{\left[tc_A + \left(1 - 2\left(p_I + T\right)\right)(1-t)\,t\right](1 - t - c_A)}\right)^{-1} \tag{14}$$

evaluated at c_A. The rest of the proposition follows from (12). From the first order condition it follows that the optimal price, p_A^v, in the interior solution is falling in the fraction of the population with access to on-line stores (v), increasing in the price and cost of on-line shopping (p_I, T), and increasing in the marginal cost (c_A). ■

Figure 1 about here

In Figure 1 we illustrate the equilibrium price in the local market as a function of the fraction with Internet access. Interestingly, the critical value $\overline{v}$ is falling in $p_I + T$. If the price in the on-line store is low, a pro-competitive effect of Internet competition in the local market is *less likely*, but *stronger*. In other words, if the price on the Internet is very low it is less attractive for the B&M store to try to compete for the customers with Internet access. If, on the other hand, it is optimal to set price so that you are also able to attract on-line users, the pro-competitive effect will be stronger the lower the Internet price is.

Since the pro-competitive effect of Internet competition depends on the degree of access to on-line retailers equilibrium prices can be radically different in a situation with relatively limited access to Internet retailers compared to a mature market with general access to Internet. More specifically, if a relatively small fraction of the population has access to Internet it is likely that prices on-line are lower than in B&M stores since the local prices are at their initial, high, level.[5] The B&M stores prefer to have high revenues in the population without access to Internet, rather than compete for consumers with access to lower prices at on-line stores. However, as a larger proportion of the population gains access to on-line stores we can expect a drastic effect of Internet competition in the B&M market. At some point it is no longer profitable for B&M firms to neglect the on-line market and, hence, the B&M price will fall discretely.

3.2 Are prices lower on the net?

Having focused on the pro-competitive effect of Internet competition in the local market we now characterize the relative prices in B&M stores and on-line stores. We do so under the assumption that everyone has access to the Internet, that is $v = 1$. The B&M store has to charge a price which is sufficiently low, i.e. $p_A < (1-t)(p_I + T)$, or else it would not have positive sales. TheB&M store solves

$$\max_{p_A} \left(\widetilde{\theta} - \theta_A\right)(p_A - c_A) \tag{15}$$

and the first order condition is the limit of (12) as $v \to 1$, i.e.

$$\left(\widetilde{\theta} - \theta_A\right) + \left(\frac{d\widetilde{\theta}}{dp_A} - \frac{d\theta_A}{dp_A}\right)(p_A - c_A) = 0 \tag{16}$$

which yields a B&M price

$$p_A = \frac{(1-t)(p_I + T) + c_A}{2} \tag{17}$$

and, hence, the optimal price is increasing in the on-line price including transportation costs and it is falling in the opportunity cost of B&M shopping. Moreover, the price on-line, p_I can be higher or lower than p_A. For relatively high access costs and relatively low opportunity costs in B&M stores, the price in B&M stores are higher than on-line prices. For relatively low access costs or relatively high opportunity costs, however, the price on-line is higher. More formally, we have the following result:

[5] A similar prediction would result in a model where Internet retailers attempted to build market shares and consumers had switching costs. While such a model could yield interesting insights (see Klemperer, 1995, for a survey of models using switching costs) we opted for the simplicity and flexibility of the present framework.

Proposition 2 *For a given price on-line, $\overline{p}_I$, the optimal price in the local store, p_A, is increasing in the access cost to on-line stores (T) and decreasing in the opportunity cost of shopping (t).*

Proof. We differentiate eq. (17) w.r.t. T and t to obtain

$$\frac{\partial p_A}{\partial T} = \frac{1-t}{2} > 0 \tag{18}$$

$$\frac{\partial p_A}{\partial t} = -\frac{(p_I + T)}{2} < 0 \tag{19}$$

and the rest of the proposition follows from the assumption about both stores being active in equilibrium, i.e. $p_A < (1-t)(p_I + T)$, and eq. (17). ■

The opportunity cost of B&M shopping (t) as well as the cost of on-line shopping (T) varies between different markets and for different products. The opportunity cost of B&M shopping tend to be lower, if the B&M stores provide pre-sale services which are important to the consumer and these services are not provided by the on-line counterparts. The opportunity cost of B&M shopping tend to be higher, if shopping is time-consuming or stressful relative to the value of the product. Hence, we expect B&M prices to be relatively lower compared to the on-line price when B&M shopping is time-consuming or pre-sale services are unimportant.

The cost of on-line shopping is also determined by a number of factors; including direct access and transportation costs as well as the complexity of the transaction. The former costs are straightforward. The magnitude of the latter, i.e. the complexity of the transaction, is affected by the design of the on-line shopping system as well as consumer behavior. Some products are recognized by name, brand or trademark, which can easily be coded and the complexity of on-line shopping can be relatively low. Other products are recognized by shape, color or physical location in the store, which makes digital coding harder and the complexity of the on-line shopping system potentially higher. Hence, we expect the B&M price to be relatively higher compared to the on-line price when the on-line transportation cost, the access cost or the complexity of on-line shopping is high.

Now, using the previous result we can characterize the exact relationship between the B&M and on-line prices. To obtain the price for which both types of firms are active in equilibrium and the optimal price in the local market is equal to the price on-line we solve eq. (17) for p to obtain the critical price

$$\widetilde{p}(t, T, c_A) = \frac{(1-t)T + c_A}{(1+t)} \tag{20}$$

which is a function of the primitive parameters of the model. For sufficiently low prices on-line, i.e. $p_I < \widetilde{p}(t, T, c_A)$, the local price is higher than the price charged by the e-retailers, $p_A > p_I$. The intuition for this is straightforward. If the fixed cost of on-line transactions is high or the opportunity cost of B&M shopping is low for a given price on-line, the B&M retailer can charge a higher price without loosing too many customers. Hence, the price in B&M stores can be higher than the price in on-line stores. For a higher price on-line, i.e. $p_I > \widetilde{p}(t, T, c_A)$, the local price has to be lower than the price charged by the e-retailers, $p_A < p_I$. The local firm has to compensate the customers for high opportunity costs of B&M shopping and the low fixed cost of on-line shopping makes e-retailers more attractive to the customer. Consequently, the price in the local market has to be lower than the price on-line.

The last result combined with proposition 1 gives an interesting and somewhat surprising result. For any on-line price such that $p_I \in (\widetilde{p}(t, T, c_A), p_A^*)$ the B&M price is higher than the on-line price as long as a small fraction of consumers have access to Internet, i.e. $v < \overline{v}$, while the B&M price falls below the price on-line as soon as a larger fraction of consumers have access to Internet.[6] The initial relationship with a lower price on-line than in the B&M store may, thus, be reversed to a lower price in the B&M store in the long run.

This result is particularly important for empirical analysis of prices in B&M and on-line stores. The observation that prices are lower on-line than in B&M stores can either depend on a low transaction cost on-line and high opportunity cost of B&M shopping or a small fraction of consumers with Internet access. In the former case the relationship holds in the long run, while it may be reversed in the latter case for any on-line price such that $p_I > \widetilde{p}(t, T, c_A)$.

[6] $(\widetilde{p}(t, T, c_A), p_A^*)$ is a non-empty set if $2T + c < 1 + t$.

3.3 Are pure Internet retailers cheaper than mixed retailers?

We now turn to a comparison of the prices of mixed (sales both on-line and in local B&M stores) and pure on-line stores. In this section we therefore assume that the on-line price is determined by a profit maximizing firm.

The issue of pricing by mixed and pure Internet retailers is interesting since it has been noted that in many industries the structure on the Internet is changing from being dominated by recent start-ups and pure Internet retailers to being dominated by firms that also have considerable sales in B&M stores.

Consider a mixed firm with a B&M store as well as a store on-line. This firm solves

$$\max_{p_A, p_I} \left(\widetilde{\theta} - \theta_A\right)(p_A - c_A) + \left(1 - \widetilde{\theta}\right)(p_I - c_I) \tag{21}$$

and the first order condition with respect to the B&M price, p_A, is

$$\left[\left(\widetilde{\theta} - \theta_A\right) + \left(\frac{d\widetilde{\theta}}{dp_A} - \frac{d\theta_A}{dp_A}\right)(p_A - c_A)\right] - \left[\frac{d\widetilde{\theta}}{dp_A}(p_I - c_I)\right] = 0 \tag{22}$$

and the first order condition with respect to the price on-line, p_I,

$$\left[\left(1 - \widetilde{\theta}\right) - \frac{d\widetilde{\theta}}{dp_I}(p_I - c_I)\right] + \left[\frac{d\widetilde{\theta}}{dp_I}(p_A - c_A)\right] = 0 \tag{23}$$

Combining these two conditions we find that the optimal B&M price is equal to the local monopoly price as derived in eq. (7), i.e. $p_A^{**} = p_A^*$. The intuition for this result is that the integrated firm considers the flow of consumers from the B&M store to the on-line store as he sets the B&M price. A reduction of the B&M price would result in a flow from the on-line store to the B&M store which would reduce the revenues in the Internet store. The direct effect on profits as well as the effect on sales (i.e. the effect on the total demand in the B&M and on-line store) is identical to the problem of the local monopolist in a segmented equilibrium.

However, the optimization problem of the local monopolist (with local sales only) and the mixed firm differ in a very important respect. The mixed firm can use the on-line market for second degree price discrimination. It can set a price in the on-line store such that high-valuation customers choose to buy on-line, while consumers with lower valuations choose to buy the goods in the local store. Solving (22) and (**??**) for p_I we find the optimal price on-line, which is

$$p_I^{**} = \frac{1 + c_I - T}{2} \tag{24}$$

and a necessary condition for opening the Internet market is that the mark-up on this market is strictly larger than the markup in the B&M store.[7] If the marginal cost in the on-line store is higher than the marginal cost in the B&M store, the price on-line (including the charge for transportation) would be higher than in the B&M store or it would not be profitable to open the on-line store. If the marginal cost on-line is very low relative to the B&M store, the latter would be closed.

Next, consider the optimal decision by a pure Internet retailer. In this case the on-line store solves

$$\max_{p_I} \left(1 - \widetilde{\theta}\right)(p_I - c_I) \tag{25}$$

and the first order condition is

$$\left[\left(1 - \widetilde{\theta}\right) - \frac{d\widetilde{\theta}}{dp_I}(p_I - c_I)\right] = 0. \tag{26}$$

which has an optimum p_I^e. The main difference between the first order condition for the independent on-line store and the first order condition for the mixed firm (**??**) is that the mixed firm takes into consideration the flow from the B&M store to the on-line store when the on-line price is reduced, reflected in the second term in square brackets in (**??**). Lower demand in the B&M store would reduce the revenues in the local B&M market. The optimal price on-line for the integrated firm is, therefore, higher than the optimal price on-line for the independent firm.

Proposition 3 *The on-line price for a firm that also has B&M sales is strictly higher than the price on-line of a pure on-line store, i.e.* $p_I^{**} > p_I^e$.

[7] which is true for $c_A + t_A > c_I > c_A (1 - t_A)^{-1}$ (upper bound from mark-up condition and lower bound from $\widetilde{\theta} > \theta_A$). If the left hand inequality is violated the firm would not open the online market. If the right hand inequality is violated the firm would close the traditional store.

Proof. Follows from the first order conditions (23) and (26). ■

This proposition shows that for a given B&M price p_A, the optimal on-line price of an integrated firms is strictly higher than the optimal price of a pure on-line retailer. The intuition for this result is, as the discussion above shows, that the integrated firm is charging a higher price on-line to avoid stealing customers from its B&M store. The pure Internet retailer, on the other hand, is going to compete for B&M customers by charging a lower price, neglecting the negative effect on the total industry profitability.

4 Empirical results

We analyze the markets for books and music CDs in Sweden. These two goods are well suited for Internet sales: Transport costs are relatively low, the goods are homogenous and the demand for services is small. Books and CDs are also easy to present to the consumer on an Internet site. Further, these markets are, by Internet standards, mature.

We collected the prices of four books and six CDs in a total of 64 B&M book stores and 98 B&M music stores located in 19 local markets across Sweden. These stores were picked at random from the yellow pages of the country's 19 largest cities. We also collected prices of these products at all eight Swedish e-commerce sites that sold books at the time of the survey, and at all eight sites that sold music CDs. All observations were made during two weeks in October 1999.

It is well established that even though we examine physically homogenous goods, the prices do not represent identical goods since service and location are also attributes of the good. Clearly, a book bought on the Internet is in some ways a different good from one bought in a book store next door. Similarly, a book in a department store in a suburb with little assortment and no specialized clerks is not the same thing as a book in a specialized book store in the city center. To gain some understanding of how this affected results, we recorded information on the stores: on location (city center, or not), type of store (such as book store, department store, supermarket), assortment (large/small) and whether it belonged to a retail chain.

We focus on two issues: Firstly, we will test Proposition 3, and secondly, we will explore whether prices on-line are lower or higher than prices in B&M stores. Proposition 3 states that the prices of pure on-line retailers should be lower than the on-line prices of mixed retailers.[8] The data is analyzed by comparing the mean prices for the different categories of stores, and by running a few simple regressions. We analyze the prices for separate items of CDs and books, and for baskets of goods. When goods are bought on the Internet, the customer usually has to pay a fee for packaging and delivery. In one sense, this fee is of course a part of the price. On the other hand, it may be viewed as payment for a service - it may be more convenient to get the goods delivered home than to go to a B&M store. To make prices comparable if we do include packaging and delivery charges in the Internet prices, we would require extremely detailed information on the consumer's opportunity cost of shopping in a regular store as well as his cost of shopping on-line. Lacking such data, we analyze prices both including and excluding packaging and delivery charges.

4.1 A first glance at prices

Data was collected on the prices of four books with different characteristics: "ALFONS" is a children's book, "CARAMBOLE" is a recent bestseller, "SAOL" is a Swedish dictionary and "LONGMAN" an English dictionary. The six CDs included in the study represent different categories of popular music. Three are international best-sellers at the time of the study: Red Hot Chilli Peppers' "Californication" (RHCP), Back Street Boys' "Millenium" (BSB) and Shania Twain's "Come on Over" (TWAIN). One is an international "classic": U2's "The Joshua Tree" (U2). One is a current Swedish bestseller: Tomas Di Leva's "För Sverige i Rymden" (DILEVA) and one is a Swedish bestseller "past its peak": Eva Dahlgren's "En Blekt Blondins Hjärta" (EVA). Summary statistics are presented in Table 1.

Table 1 about here.

It is clear from this table that there is substantial price dispersion. This is the case both for B&M and on-line stores. The average within market price range (difference between highest and lowest price in a given location) is over

[8] The two other propositions are in many ways premature to test and would require other data than we have been able to assemble. To test Proposition 1 one would ideally follow a time series of prices and internet usage. To test Proposition 2 one would ideally examine prices on a large number of goods.

one tenth of the mean price for each of the products.[9] In one case (EVA), the average within market range is 44 percent. The largest absolute price difference within a single market on any product was for CARAMBOLE in the city of Umeå, where the price ranges from SEK 119 to SEK 259.

An illustration of the data is given in Figure 2, where the prices of the four books are plotted for each location. A standout feature is the great price dispersion within locations while there are few obvious signs of price dispersion across locations. A rough comparison of prices on the Internet and in B&M stores indicates that for three of the books, prices are somewhat lower on the Internet, or at least that the lowest price on the Internet is lower than the minimum price on most of the local markets.

Figure 2 about here.

It is also evident from these diagrams that there is considerable variation in prices on the Internet. In fact, the price range for on-line stores is larger than the average within market price range for all books and about the same for four of the six CDs (for the two remaining CDs, it is higher for one and lower for the other). Including the cost of transportation in the Internet prices does not alter this picture. The high price dispersion on the Internet is somewhat surprising given the relative ease for consumers to compare prices of different e-retailers.[10]

The smallest price dispersion, both in absolute and relative numbers, is found for the bestseller CDs, both on-line and in B&M stores. A probable explanation is the relatively strong competition on these products.

4.2 Where is the price lowest?

In all the Internet stores, the consumer pays a fixed cost for transportation and packaging regardless of how many books or CDs she orders. Thus, it may be cheaper to buy on the Internet for a consumer who buys several items while it is cheaper to buy in a regular store for a consumer buying only one

[9] The one exception to this is LONGMAN, where the average within market price range is only 5 percent of the mean price. However, that figure is misleading since LONGMAN was either unavailable or sold in only one store in all but one local market. On this market (Uppsala), it was sold in two out of the five stores included.

[10] Given the well known difficulties in generating price dispersion in plausible models we have not attempted to incorporate search costs or other features that could yield equilibrium price dispersion in the model. See XX Survey, Economics of Information i Handbook of Industrial EcononicsXX

item. To take account of this, we analyze the prices of both separate items and of baskets of goods. The book basket contains three books (LONGMANS was excluded due to the few observations). For CDs, two different baskets are constructed. One which we call "Top 4" includes current bestselling CDs - RHCP, BSB, TWAIN and DILEVA, and the other contains all six CDs.

In Table 2, summary statistics for the different categories of retailers are presented for the book-basket, and for one book, CARAMBOLE. On average, prices of both CARAMBOLE and the basket are lower on the Internet. The basket is on average close to 15 percent cheaper if bought on the Internet rather than in a B&M store. A two tailed t-test rejects that the mean price in B&M stores equals the mean price on the Internet at the 10 percent level. If transport costs are included in the price the basket is on average some 9 percent cheaper if bought on the Internet. The difference is, however, not significant at any usual levels of significance using a two tailed t-test.

Table 2 about here

As predicted by Proposition 3 mixed stores have higher on-line prices than the pure Internet retailers. In fact, all the pure Internet retailers have lower prices than the cheapest mixed firm's Internet prices, whether or not transport costs are included. Since this is the full population of Swedish Internet stores, the difference in means is in one sense significant by definition.[11] The prices of the pure Internet retailers are also lower than in B&M stores, whether or not transport costs are included. The hypothesis that the mean prices are equal in B&M stores and pure Internet stores can be rejected at least at the 1 percent level in both cases. It is worth noticing that this holds also for CARAMBOLE, i.e. also when buying just one book. The gain is thus large enough not to be outweighed by transport costs.

Another way of comparing the prices on-line and in B&M stores is to consider a well informed consumer who lives in one of the local markets and buys the books so as to minimize the total price he pays for the basket. Thus, he may buy from one or several on-line stores, from one or several B&M stores in the city where he lives, or any combination thereof. It turns out that in all but one of the local markets, the cheapest alternative is to buy all three books from one on-line bookstore. In the remaining market,

[11] If instead we view the prices in themselves as a result of a stochastic process, we may apply the usual tests, and then find that the hypothesis that the means are the same within the two groups may be rejected at any usual level of significance.

the cheapest alternative was to buy one book only from a B&M store, and the two other from an on-line store.[12]

The conclusions of the analysis of the CD market are very similar to those from the analysis of the book market. In Table 3, summary statistics for the different categories of retailers are presented for the "Top 4" basket, and for two individual CDs. Looking first at the basket we see that prices are some 14 percent lower on the Internet than in B&M stores. Using a two tailed t-test, the hypotheses that the outlets have equal mean prices is rejected at the 1 percent level of significance. When transport costs are included, the difference between average prices shrinks to some 10 percent, but we still reject the hypothesis that the two types of outlets have equal mean prices.

If the consumer chooses to buy just one CD on the Internet, the picture changes - average prices including transportation costs are almost identical to prices charged by B&M retailers for single item purchases. The difference between the two is not statistically significant. On average, shipping and handling for an individual CD adds 15 percent to the price charged on-line. Since shipping and handling costs are fixed and independent of the number of CDs bought, the average transportation cost falls when more than one item is bought at the same occasion.

Table 3 about here.

Also on the CD market Proposition 3 is supported - pure Internet retailers have lower on-line prices than mixed retailers. On average, the pure on-line retailers have lower prices on all CDs in the "Top 4" basket.[13] For the two baskets, the pure Internet retailers are on average cheaper than the mixed firms whether or not transport costs are included. When transport costs are excluded, the maximum price of the Top 4 basket among pure Internet retailers is lower than the minimum price among the mixed retailers.

Of the, in total, 16 on-line retailer from which we collected price data, six are mixed retailers. It is of some interest to compare the prices in the on-line and B&M operations of these firms. Two of these six firms are large book retail chains with operations in most Swedish cities (17 each in our

[12] The price for CARAMBOLE in Umeå, SEK 119, was the lowest price found for that book in the full sample. The second lowest price, which was SEK 64 less, was found in one of the on-line stores.

[13] On the two remaining records, one of the mixed retailers has prices low enough to push the averages below the averages for the pure Internet retailers.

sample) and one is a large chain of department stores that also sells CDs on the Internet (12 in our sample). Of the remaining three, one is a bookstore with two B&M outlets and two are CD stores with one B&M store each. None of these firms had consistently lower prices on-line than in the B&M business.[14] The evidence is consistent with the notion that the mixed firms do not want to undercut the prices in their B&M operations.

4.3 A few simple regressions

As noted previously, the price of a good should reflect not only if it is bought on Internet, but also other characteristics of the outlet. To partly control for such characteristics, we ran simple OLS regressions to examine how prices depend on characteristics of the outlet. A number of dummy variables are used as explanatory variables. BOOKST/CDST is one for specialized book/CD stores, CENTER is one for stores located in the city center, LARGE is one for B&M stores with large assortment and NOCHAIN, finally, is one for retailers that do not belong to a retail chain.[15]

Table 4 about here.

We estimated regressions on the separate items as well as on the book-basket and the two CD-baskets. The regressions were estimated both with prices including and excluding transport costs and with two alternative "Internet-dummy" specifications. One group of regressions contained only the dummy for Internet stores (INTERN), and the other group had separate dummies for pure (INTPURE) and mixed (INTMIX) Internet firms. All in all, that makes

[14] For the two book chains, the prices online including transport costs were higher than in any of the B&M outlets (with the excpetion of one observation on LONGMAN). The book retailer with two B&M outlets had a lower on-line price on two books, a higher price on one book, and a price in between the two B&M outlets on one book. With a few exceptions, the mixed CD stores had virtually identical prices online and and in the B&M stores. (In two of these cases the prices including transport costs were the same as in the B&M stores, and in the third case the prices excluding transport costs were the same.)

[15] We also experimented with other explanatory variables such as the number of firms in each city and some fairly crude measures of costs. Our ability to explain variation in prices across locations was limited. Given the very limited evidence of systematic differences in prices across locations for these two types of goods this is no surprise. There exists a large literature that examines prices of goods across markets and try to relate such variation to measures of the market structure. See for instance Weiss (1989) or Asplund and Sandin (1999) for a recent contribution.

32 CD-regressions and 16 regressions on books. To spare the reader, we will not present the full results from all of these. In Table 4, the results from the regressions on the book basket, with and without transport costs, and regressions on three books without transport costs are presented. In Table 5, corresponding regressions on one of the CDs and on the two CD-baskets are presented.

Table 5 about here.

The coefficients of prime interest are on the three Internet-dummies. Our earlier conclusions are again seen in the regression results: Buying on the Internet is cheaper than buying in B&M stores, and pure Internet retailers are cheaper then mixed firms.

For books, the dummy for pure Internet retailers is negative and significant in most regressions, while the dummy for mixed firms is not significant. This result holds for the basket whether or not we include transport costs. For the individual books, we get the same results when transport costs are not included. When transport costs are included (not reported), the Internet-dummies are no longer significantly different from zero, except in one case.[16] For CDs, every single Internet-dummy is negative and significant at the 1 percent level in all regressions with basket prices as dependent variable, and also in the regressions on individual CDs when transport costs are excluded. In the regressions on individual CDs where transport costs are included, not any of the Internet-dummies are significantly different from zero.

That the characteristics of the store in which the good is bought affect price is confirmed by the estimation results for the other explanatory variables. Prices of the basket are higher in specialized bookstores (BOOKST), likely reflecting better service. However, there is some variation across individual books: CARAMBOLE is cheaper in specialized book stores. Being located in the center of the town is associated with around 5 percent lower prices for this book. Independent firms tend to have lower prices but the effect is generally not statistically significant. In the CD-regressions, the coefficient of CDSTORE is positive in all the regressions. (However, it is only significantly different from 0 for RHCP). Again, this probably reflects that specialized stores provide better service than supermarkets or general department stores. For the six-CD basket, the coefficient on CENTER is negative,

[16]The exception is the CARAMBOLE-regression, in which the INTMIX-dummy is positive and significant at the 10 percent level.

as in the book-regressions. This is not the case in the other CD-regressions, however. In contrast to the case for books, larger stores tend to have higher prices. There is little evidence that the price of independent stores differed from the average.

Adjusted R-square in the basket-regressions ranges from 0.08 to 0.61 with, in general, higher explanatory value for the regressions with separate dummies for mixed and pure on-line retailers, and for the regressions where transportation costs are excluded from the on-line prices. Explanatory power is, however, mostly weak in the regressions on separate items.[17]

5 Conclusions

This paper has developed a highly stylized model with the features that the prices in B&M stores depend on the opportunity cost of shopping in B&M stores as well as on transportation costs and access costs for Internet shopping, and on what proportion of the population that has access to the Internet. A central conclusion is that we expect B&M retailers to ignore the on-line market when setting their prices until the share of the population with Internet access reaches a critical level. When this threshold is reached, however, prices should fall discretely. Thus, an important caution is not to dismiss the effects of e-commerce based on current evidence. This is especially the case since the empirical evidence that we do have, does in fact indicate that prices on the Internet are lower than B&M prices. Prices for a basket of books or CDs is some 15 percent cheaper if bought on the Internet than in B&M stores (some 10 percent if transport costs are included in the on-line price). Thus, if and when B&M firms choose to compete with the on-line market, we may experience a substantial fall in prices.

A crisp prediction of the theoretical model is that pure on-line retailers

[17] For the CDs, adjusted R-square is between 0.00 and 0.13 when transport costs are included, and between 0.19 and 0.33 when transport costs are not included in the online prices. In the book-regressions, adjusted R-square is below 0.06, and in a few regressions it is even negative (ALFONS and SAOL). However, the explanatory power of the regressions on CARAMBOLE are considerably stronger: 0.15 and 0.30, with transport included and excluded, respectively. There is some logic to these results. A firm would forego much profit if its price is wrong on the CDs, all of which are good selling or on the bestseller CARAMBOLE. The two remaining books, however, are not top-selling products, and as a consequence, the loss from setting a suboptimal price is smaller. Thus, the pure random components of these prices are likely to be larger.

should charge lower on-line prices than mixed firms. This prediction is borne out by the empirical analysis. The mixed firms will be cautious of "cannibalization", i.e. that they will loose profits if they undercut their B&M prices in their on-line operation. Thus, the simplest strategy may be to charge basically the same prices in both retail channels.

Another result from the theoretical model is that B&M prices will depend on the access and transportation costs for on-line shopping (Proposition 2). The empirical analysis also indicates that the handling and shipping fee charged by the on-line retailer is important. In some cases, at least when the consumer buys only one item, this fee eliminates the saving due to lower prices. As pointed out earlier, it is not obvious that this cost should be considered to be a part of the price, since it may instead be viewed as the payment for a service. However, it is clear that a fall in transport costs may have a large impact both on prices and the volume of e-commerce. It is reasonable to think that transport costs will in fact fall in future. For products where electronic delivery is possible, transport costs will essentially be eliminated. The growth of electronic trade may also create economies of scale in transports that cause costs to fall.

Consistent with the model we expect e-commerce to have the largest impact on standardized products that are cheap to transport and relatively easy to sell on-line. If there are large potential cost savings from selling on-line, on-line sales are also likely to be large. Thus, the two products in our study, books and music, are quite well suited for the Internet. Financial services, where the potential for cost reductions are large, is also one area where electronic commerce has flourished, and is likely to continue to do so.

Finally, it should be emphasized once more that Internet-retailing is a new phenomenon. The Mosaic browser, which first made the Internet available to "ordinary" people, was launched less than 10 years before this study. Thus, the worn out phrase that "more research is needed" may be more appropriate than usual.

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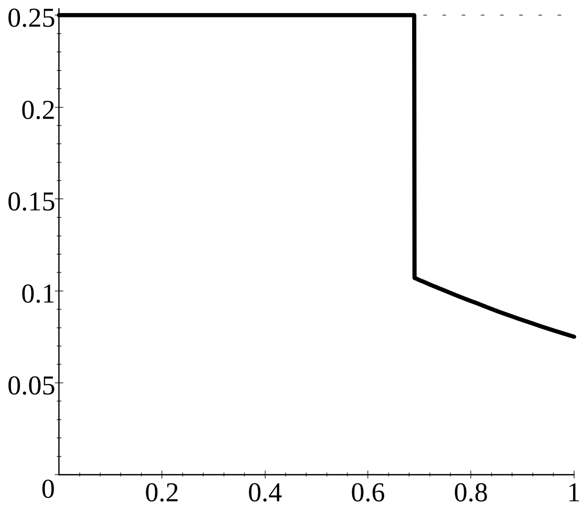

Figure 1: The pro-competitive effect of Internet competition

	(SEK)	N	Mean	Std. Dev.	Min	Max	Range Total	Range Intra-market	Range On-line
Books:	SAOL	67	208.09	32.76	146	268	122	58	122
	CARAMBOLE	60	263.70	37.91	119	332	213	52	80
	ALFONS	49	118.78	21.94	84	148	64	35	54
	LONGMAN	14	391.14	76.20	288	528	240	19	125
	Delivery cost	8	33.75	14.33	0	45	45		
CDs:	RHCP	96	158.53	13.41	127	189	62	22	22
	BSB	87	159.87	13.94	129	199	70	21	20
	TWAIN	92	159.72	12.91	129	189	60	21	20
	DILEVA	96	159.67	13.99	125	199	74	23	24
	U2	79	166.15	18.32	109	189	80	30	40
	EVA	47	104.00	23.86	69	189	120	46	20
	Delivery cost	7	21.34	9.96	0	29	29		

Table 1 – Summary statistics for the price data. Statistics in all except the two rightmost columns are computed on the full sample. The intra-market range is the mean of the range of prices in all local markets, excluding markets where zero or one stores sold the product. The last column is the range of prices among the on-line stores.

		Mean *Std.dev*	Min *25th*	Median	Max *75th*	Mean *Std.dev*	Min *25th*	Median	Max *75th*	N
		Exclucing transport				Including transport				
Caram-bole	All	263.7 *37.91*	119 *249*	259	332 *288*	267.4 *34.35*	119 *249*	259	332 *288*	60
(SEK)	B&M	269.5 *35.1*	119 *259*	259	332 *288*	269.5 *35.1*	119 *259*	259	332 *288*	53
	All Internet	219.7 *29.94*	183 -	209	263 -	251.8 *24.59*	222 -	248	299 -	7
	Mixed Internet	261 *2.828*	259 -	-	263 -	281 *25.46*	263	-	299	2
	Pure Internet	203.2 *12.21*	183 -	207	215 -	240.2 *12.26*	222	238	254	5
Basket *(Dev. from sample mean, %)*	All	0 *10.88*	-30.04 *-7.34*	1.47	18.24 *6.05*	0 *9.97*	-23.96 *-7.98*	0.77	18.60 *5.31*	45
	B&M	1.94 *8.57*	-14.11 *-4.12*	2.49	18.24 *8.25*	1.23 *8.51*	-14.71 *-4.79*	1.78	17.42 *7.50*	39
	All Internet	-12.59 *16.22*	-30.04 -	-18.18	12.65 -	-7.98 *15.34*	-23.96 -	-13.03	18.60 -	6
	Mixed Internet	7.06 *7.91*	1.47 -	-	12.65 -	9.68 *12.61*	0.77 -	-	18.60 -	2
	Pure Internet	-22.41 *5.62*	-30.04 -	-20.80	-18.01 -	-16.81 *5.23*	-23.96 -	-15.64	-12.02 -	4

Table 2 – Summary statistics on the prices of books for different categories of stores. The statistics are computed for ordinary, "brick and mortar" stores, for all Internet stores, and for the latter category subdivided between mixed Internet stores, meaning firms that also sell in B&M stores, and pure Internet stores. The statistics are displayed for one separate item, CARAMBOLE, and for a basket consisting of three of the books. (LONGMAN dictionary was excluded due to too few observations.)

		Mean	Min	Median	Max	Mean	Min	Median	Max	N
		Std.dev	*25^{th}*		*75^{th}*	*Std.dev*	*25^{th}*		*75^{th}*	
		Exclucing transport				Including transport[*]				
Red Hot Chilli	All	158.5	127	159	189	160.4	139	159	189	96
Peppers		*13.41*	*149*		*169*	*11.85*	*149*		*169*	
	B&M	160.5	139	159	189	160.4	139	159	189	88
(SEK)		*12.05*	*149*		*169*	*12.05*	*149*		*169*	
	All internet	137.4	127	139	149	159.9	149	157.4	178	8
		8.815	-		-	*9.736*	-		-	
	Mixed internet	145.7	139	-	149	161.5	149	-	178	3
		5.774	-		-	*14.92*	-		-	
	Pure internet	132	127	129	139	158.8	153	-	164	5
		6.066	-		-	*6.076*	-		-	
U2	All	166.2	109	169	189	168.2	126	196	189	79
		18.3	*149*		*179*	*16.42*	*159*		*179*	
(SEK)	B&M	169.0	126	169	189	169.0	126	169	189	72
		16.1	*159*		*179*	*16.15*	*159*		*179*	
	All internet	137.3	109	139	149	159.4	127.4	164	178	7
		14.4	-		-	*18.62*	-		-	
	Mixed internet	135.7	109	-	149	151.5	127.4	-	178	3
		23.09	-		-	*25.4*	-		-	
	Pure internet	138.5	129	139	147	167.3	164	-	174	4
		7.371	-		-	*5.774*	-		-	
Basket	All	0	-18.85	0.02	22.04	0	-13.06	-0.55	21.34	74
(Dev.		7.84	*-6.27*		*4.74*	*7.046*	*-6.81*		*4.14*	
from	B&M	1.52	-12.56	0.02	22.04	0.94	-13.06	-0.55	21.34	66
sample		*6.71*	*-3.12*		*6.31*	*6.67*	*-3.68*		*5.70*	
mean, %)	All internet	-12.58	-18.85	-12.56	-6.27	-8.85	-12.75		-2.27	8
		4.47	-		-	*3.48*	*-11.66*		*-6.81*	
	Mixed internet	-8.36	-12.56	-	-6.27	-6.42	-10.18	-	-2.27	3
		3.63				*3.97*	-		-	
	Pure internet	-15.1	-18.85	-15.39	-12.56	-10.68	-12.75	-	-9.15	5
		2.66	-		-	*1.82*	-		-	

Table 3 – Summary statistics on the prices of music CDs for different categories of stores. The statistics are computed for ordinary, "brick and mortar" stores, for all Internet stores, and for the latter category subdivided between mixed Internet stores, meaning firms that also sell in B&M stores, and pure Internet stores. The statistics are displayed for two separate items, RHCP and U2, and for a basket consisting of four of the CDs: RHCP, BSB, TWAIN and DILEVA, our "Top 4" basket.

[*] For one "pure" on-line store, the transport cost is missing, thus, the number of observations for the statistics "including transport" are one less than the number presented in the rightmost column of the table for the all rows except "B&M" and "mixed internet".

	Alfons		Carambole		SAOL		Basket			
			Excluding transport				Excluding transport		Including transport	
N	49	49	60	60	67	67	45	45	45	45
Std.d.	0.185	0.180	0.120	0.119	0.160	0.153	0.097	0.084	0.095	0.085
R^2	0.107	0.165	0.357	0.381	0.041	0.142	0.290	0.483	0.187	0.374
Adj. R^2	0.003	0.046	0.298	0.311	-0.038	0.056	0.199	0.402	0.083	0.275
Const.	-0.102	-0.130 **	0.227 ***	0.211 ***	0.031	-0.004	0.028	-0.033	0.015	-0.039
	0.063	*0.058*	*0.057*	*0.060*	*0.095*	*0.087*	*0.053*	*0.046*	*0.052*	*0.046*
Intern	-0.117		-0.137 ***		-0.092		-0.119 *		-0.068	
	0.072		*0.042*		*0.075*		*0.065*		*0.063*	
Intpure		-0.232 ***		-0.188 ***		-0.247 ***		-0.243 ***		-0.179 ***
		0.062		*0.050*		*0.046*		*0.044*		*0.043*
Intmix		0.057		-0.037 *		0.084		0.058		0.091
		0.063		*0.021*		*0.088*		*0.043*		*0.065*
Bookst	0.108	0.117 *	-0.106 ***	-0.097 **	-0.003	0.013	0.064 **	0.097 ***	0.066 **	0.097 ***
	0.071	*0.067*	*0.039*	*0.041*	*0.079*	*0.072*	*0.031*	*0.032*	*0.031*	*0.031*
Center	0.033	0.038	-0.136 ***	-0.132 ***	-0.026	-0.026	-0.066 *	-0.055 *	-0.064 *	-0.054 *
	0.073	*0.067*	*0.048*	*0.048*	*0.053*	*0.052*	*0.036*	*0.031*	*0.035*	*0.031*
Large	0.007	0.012	0.046	0.045	0.013	0.022	-0.004	0.003	-0.003	0.003
	0.062	*0.062*	*0.033*	*0.033*	*0.045*	*0.045*	*0.031*	*0.030*	*0.030*	*0.030*
Noch.	-0.050	-0.010	-0.077 *	-0.059	-0.013	0.026	-0.044	0.005	-0.039	0.005
	0.049	*0.053*	*0.040*	*0.044*	*0.040*	*0.040*	*0.038*	*0.034*	*0.037*	*0.034*

Table 4 – Regressions on books. Results are presented for regressions on three of the books on the prices excluding transportation costs and for the regressions on the book basket excluding and including transportation costs. Two different specifications were run on all of these, with only an Internet dummy, and with separate dummies for pure and mixed Internet retailers. Standard errors in italics. One, two and three asterisks denote that the coefficient estimate is significant at, respectively, the 10, 5 and 1 percent level of significance.

	Californication		Basket 1: All 6 CDs				Basket 2: Top 4			
	Excluding transport		Excluding transport		Including transport		Excluding transport		Including transport	
N	95	95	34	34	33	33	73	73	72	72
Std.d.	0.070	0.069	0.060	0.059	0.058	0.059	0.065	0.064	0.064	0.064
R^2	0.351	0.373	0.678	0.692	0.599	0.603	0.369	0.394	0.238	0.251
Adj. R^2.	0.315	0.331	0.620	0.623	0.525	0.512	0.322	0.339	0.180	0.182
Const.	-0.023	-0.026	0.083	0.068	0.070	0.063	-0.026	-0.029	-0.033	-0.034
	0.020	*0.020*	*0.055*	*0.056*	*0.055*	*0.055*	*0.021*	*0.021*	*0.021*	*0.021*
Intern	-0.160 ***		-0.213 ***		-0.181 ***		-0.161 ***		-0.118 ***	
	0.024		*0.019*		*0.015*		*0.022*		*0.019*	
Intpure		-0.195 ***		-0.234 ***		-0.192 ***		-0.192 ***		-0.142 ***
		0.022		*0.018*		*0.016*		*0.020*		*0.018*
Intmix		-0.105 ***		-0.173 ***		-0.163 ***		-0.113 ***		-0.088 ***
		0.018		*0.023*		*0.018*		*0.016*		*0.019*
CDst	0.051 ***	0.053 ***	0.011	0.025	0.015	0.021	0.025	0.028	0.026	0.027
	0.017	*0.017*	*0.025*	*0.027*	*0.024*	*0.026*	*0.017*	*0.017*	*0.017*	*0.017*
Center	0.000	0.000	-0.105 *	-0.105 *	-0.104 *	-0.104 *	0.020	0.020	0.020	0.020
	0.022	*0.022*	*0.055*	*0.055*	*0.055*	*0.054*	*0.023*	*0.023*	*0.023*	*0.023*
Large	0.036 **	0.036 **	0.046 **	0.049 **	0.047 **	0.048 **	0.017	0.016	0.017	0.016
	0.016	*0.016*	*0.023*	*0.023*	*0.022*	*0.023*	*0.017*	*0.017*	*0.017*	*0.017*
Noch	-0.035 *	-0.033 *	0.027	0.029	0.027	0.028	0.004	0.006	0.005	0.006
	0.019	*0.019*	*0.023*	*0.023*	*0.023*	*0.023*	*0.020*	*0.020*	*0.020*	*0.020*

Table 5 – Regressions on CDs. Results are presented for the regression on one of the CDs on the prices excluding transportation costs and for the regressions on the two baskets, one including all six CDs and one including only the "Top 4" CDs (RHCP, BSB, TWAIN and DILEVA). For the baskets, the results are presented on prices excluding and including transportation costs. Two different specifications were run on all regressions, with only an Internet dummy, and with separate dummies for pure and mixed Internet retailers. Standard errors in italics. One, two and three asterisks denote that the coefficient estimate is significant at, respectively, the 10, 5 and 1 percent level of significance.